

PREVALENCE OF RESPIRATORY SYMPTOMS AND RISK FACTORS AMONG POULTRY FARM WORKERS IN OWERRI SENATORIAL ZONE, NIGERIA

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Respiratory ill-health among poultry farm workers has been associated with exposure to occupational predisposing factors. Studies have reported respiratory symptoms to be prevalent among poultry farm workers and related to working in poultry farms, but there is a dearth of published studies on the respiratory health of poultry farm workers in Nigeria. This study was carried out to determine the prevalence of respiratory symptoms among poultry workers in Owerri Senatorial Zone and elucidate the influence of predisposing/risk factors. A descriptive survey involving 400 poultry farmworkers from 20 poultry farms recruited through a multistage sampling technique was carried out using semi-structured questionnaires for data collection. Spearman correlation test was performed to determine the relationship between respiratory symptoms and predisposing factors (smoking and duration of work years). From the study, Male workers were dominant, 32.5% were smokers and 10% had worked in poultry farms for more than 15 years. 87% of the workers had cough; with wheeze and breathlessness in 32.5% and 30% of the workers respectively. Wheeze showed perfect association with smoking (1.00; df 4 @ p-value <0.05), cough showed very weak association with smoking (0.262; df 4 @ p-value < 0.05) and chest pain had strong association with duration of work years (0.774; df 4 @ p-value <0.05). The results have a strong implication for the establishment of occupational health services and improved poultry dust control in the poultry industry.

Keywords: prevalence, respiratory symptoms, poultry workers.

INTRODUCTION

The economic importance of poultry farms cannot be over-emphasized, as poultry farming is one of the

most dynamically developing branches of modern agriculture (Lawniczek-Walczyk et al., 2013). Despite

these positive features, poultry farm workers are constantly exposed to agents causing health hazards (Das et al., 2014) and experience the risk of respiratory health problems, allergies, bacterial, parasitic and viral infections (Ngajilo, 2014). Air inside modern animal production facilities where intensive poultry breeding is conducted is contaminated by a wide variety of airborne respiratory irritants such as gases (like ammonia and carbon dioxide) and poultry dust which is a complex mixture of organic and inorganic materials derived from soil, bedding materials, feed/feed components, chemical and therapeutic additives, dried fecal materials, feather particles as well as microbiological and invertebrate contaminants (Health and Safety Executive, 2009; Hartung and Schulz, 2011; Brodka et al., 2012; Jerez et al., 2014).

The most occupationally related health problem widely reported among poultry farm workers is respiratory health problem ranging from asthma, pneumonia, bronchitis, avian influenza (Matuka and Singh, 2010; Guillam et al., 2017; Hamid et al., 2018). Symptoms such as cough, wheeze, eye irritation, phlegm production, nasal congestion and even sore throat have also been reported and studies have reported a high prevalence of respiratory symptoms among poultry farmworkers, with cough, phlegm, wheeze and breathlessness widely reported (Faria et al., 2006; le Bouquin et al., 2014; Jaiyesimi and Agbaje, 2015; Guillam et al., 2017; Hamid et al., 2018).

Inhalation has been established as the main route of exposure to respiratory irritants that can cause health effects (Jerez et al., 2014), and epidemiological studies have shown that the respiratory health of poultry farmers working in these confined buildings/units may be harmed by regular exposure to and inhalation of poultry dust for prolonged periods especially during activities involving breeding, raising and taking care of poultry birds; with acute and chronic respiratory disease symptoms being prevalent among poultry farm workers (Nwagwu et al., 2010; Hamid et al., 2018). Factors such as duration of work years, hours spent at work, smoking, age above 50 years and pre-existing respiratory diseases can predispose an individual (worker), while increasing the risk of susceptibility to respiratory symptoms caused by occupational exposure to respiratory irritants in the poultry farms which in turn results in the inability of the worker to meet the demands of his job, incidence of illness, absenteeism and eventually early

retirement (Ngajilo, 2014; Tobin et al., 2016). The study was carried out to determine the prevalent respiratory symptoms among the poultry farm workers in Owerri Senatorial Zone and associated predisposing factors. It is envisaged that the results of this study will add to the body of knowledge on the respiratory health of poultry farm workers in Nigeria and provide useful information for advocacy to health and labor agencies; and for planning and design of interventions targeted towards better health and safety management in the poultry industry.

MATERIALS AND METHODS

STUDY LOCATION

The study was purposively conducted in Owerri senatorial zone of Imo State Nigeria. The zone selection was based on proximity, familiarity, cost and predominance of poultry farms. It is made up of nine local government areas; covering around 170 km² and shares boundaries with Abia State by the east and rivers State by the south. Its inhabitants engage primarily in agriculture, business and civil service (Unuegbu, 2012; Onyekwere et al., 2013). A typical poultry farm is a large shed of unsophisticated structure with a frame of shelter made of concrete and a roof of corrugated iron sheets. The flooring is generally concrete but some have earth floors. The poultry birds are confined and housed in litters of milled wood fiber (saw dust) or battery cages; with feeders and drinkers mounted. Mechanization is absent since labor is cheap and supply of electricity inconsistent. Climate control is zero, ventilation is strictly natural and lighting is artificial (except when electricity is available). The main activities of poultry workers in a poultry farm include feeding of birds, grooming of birds, collection of eggs, cleaning of poultry houses (breeding rooms); processes which generate dust; some of which is visible to the naked eye as seen on the walls, floors and ceiling (Pagni et al., 2008).

STUDY POPULATION AND DESIGN

The study which was carried out between April and May 2018 utilized a cross sectional descriptive study design. The respondents comprised of poultry workers who have been in continuous employment at the farm for at least 6 months preceding the study. Sample size was calculated using the formulae for

determining the sample size for infinite population since the exact number of poultry workers in Owerri senatorial zone was unknown; with sample size of 385 generated but rounded up to the nearest hundred. Thus, sample size of 400 was taken.

SAMPLING METHOD

A multistage sampling technique was used to select respondents. In the first stage, five local government areas in the zone were selected randomly. In the second stage, purposive sampling was employed to select only registered commercial poultry farms in the selected local government areas. List of registered commercial poultry farms was obtained from the Imo State Agricultural Development Program. Thus, in each of the selected local governments, four commercial poultry farms were randomly selected to give a total of 20 farms. In the third stage, at each selected farms, random sampling was employed to select 20 respondents, giving a total of 400 participants.

DATA COLLECTION TECHNIQUE

Data was collected using questionnaires distributed and collected by agricultural extension workers of the Imo State Agricultural Development Program who were familiar with the content of the questionnaire, manner of approach and location of the poultry farm selected. The questionnaire was used to obtain information on the socio-demographic characteristics of the participants, prevalence of respiratory symptoms and factors influencing the occurrence of respiratory symptoms among poultry workers in the study area. In cases where a respondent were unable to fill the questionnaire due to low literacy, the questions were translated and asked in local language and answers were recorded as given.

INFORMED CONSENT

An introduction letter was given to the managers/directors of the selected poultry farms before workers were interviewed. Informed consent was also obtained from each participant prior to the interview.

DATA ANALYSIS

Data was analyzed using statistical package for social science (SPSS) version 20.0.

RESULTS

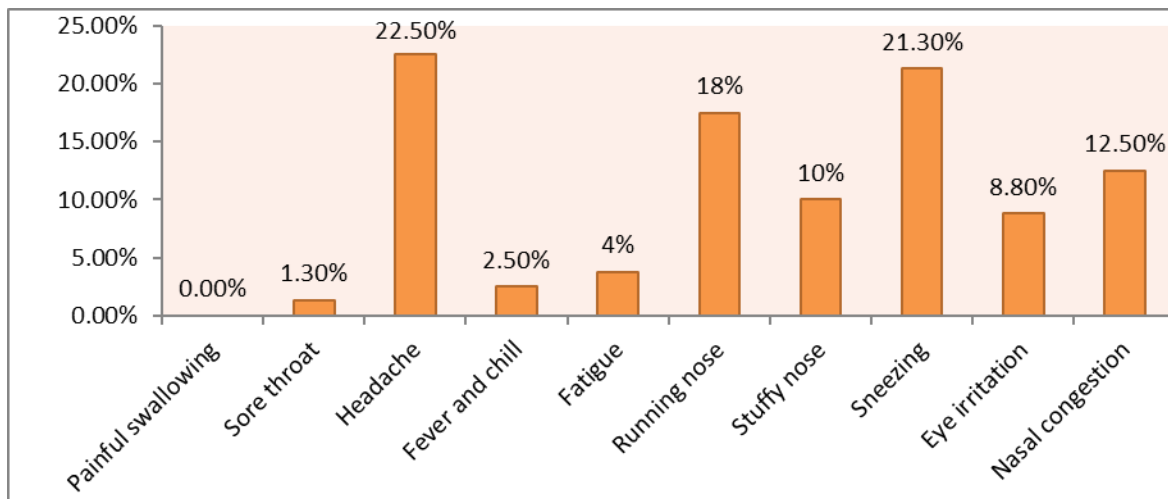
A total of 400 poultry workers were interviewed. Socio demographic characteristics of the poultry farm workers showed the mean age of respondents was 34.3 (SD \pm 6.785) years with the highest age range at 31-35 years. The majority of the respondents were males. 87.5% of the respondents were of the Igbo ethnic group and 32.5% of the respondents earned ₦31,000 - ₦40,000 monthly. Educational attainment of the respondents ranged from secondary education (55%) to non-formal education (2.5%). The highest level of income earned monthly by workers ranged from ₦31,000- ₦40,000 (32.5%) with 1.3% of the respondents earning less than ₦10,000 monthly. Prevalence of respiratory symptoms among poultry farmworkers was as follows: cough 87.5%, phlegm production 65%, breathlessness 30%, chest pain 30%, chest tightness 30% and wheeze 32.5% (Table 1). Other symptoms such as headache, stuffy nose, sneezing and sore throat were represented in Figure 1. Risk factors such as smoking habits of the worker, number of hours spent at work place, duration of work years and preexisting respiratory health conditions of the workers were represented in Table 2 with Pneumonia (5.5%) highly reported among the poultry farm workers. One hundred and thirty respondents (32.5%) were reportedly smokers; with duration of work years of the respondents ranging from 1-4 years (50%) to less than 1 year (5%). From Tables 3 and 4, the presence of respiratory symptoms among the poultry farm workers was significantly associated with smoking habits and duration of work years respectively. Wheeze showed perfect association with smoking (1.00; p-value <0.05), cough showed very weak association with smoking (0.262; p-value < 0.05) and chest pain had strong association with duration of work years (0.774; p-value <0.05).

DISCUSSION

In this study, male workers outnumbered the female workers and this finding is consistent with previous studies that attributed the hiring of male workers in poultry farmers (Faria et al., 2006; Viegas et al., 2013). This is understandable since it is a physically demanding job (Ngajilo, 2014). The majority of the workers were 31-35 years old (34 ± 6.785) and only 1.25% of the workers were above 50 years. The healthy worker effect phenomenon may be a reason for this observation (Shah, 2009; Chowdhury et al.,

Table 1. Prevalence of respiratory symptoms among the poultry farm workers.

Self-reported Symptoms	Respiratory	Study Population (n = 400)	
		Yes	No
		Frequency (%)	Frequency (%)
Cough		350 (87.5)	50 (12.5)
Phlegm production		260 (65)	140(35)
Breathlessness		120 (30)	280(70)
Wheeze		130 (32.5)	270(67.5)
Chest pain		120 (30)	280 (70)
Chest tightness		120 (30)	280 (70)

**Figure 1.** Other respiratory symptoms reported among the poultry farm workers.

2017). Respondents were predominantly of the Igbo ethnic group and this is attributed to the fact that the study location is in a south eastern state of Nigeria whose people are predominantly Igbo. Level of education ranged from secondary education (55%) to no formal education (2.5%); with the highest level of income earned monthly by workers at ₦31,000 - ₦40,000 (32.5%) and 1.3% of the workers affirming to earning less than ₦10,000 monthly which is below the national minimum wage (Elegu and Ikwumokoni, 2018). Poultry workers tend to earn low wages of diminishing values and scant benefits with level of education playing a significant role in the allocation of wages/salaries while carrying out tasks that are dirty, demanding and health reducing (Ngajilo, 2014).

Common respiratory symptoms reported in this

study by poultry workers were cough, phlegm production, breathlessness, wheeze, chest pain, chest tightness as well as nasal congestion, sneezing, runny nose and headache. This observation is in line with observation from similar studies (Faria et al., 2006; Skorska et al., 2007; Viegas et al., 2013; Le Bouquin et al., 2014; Jaiyesimi and Agbaje, 2015; Guillam et al., 2017; Hamid et al., 2018). The high prevalence of respiratory symptoms in the study group gives the impression that occupational exposure to poultry dust and involvement in poultry activities expose workers to a high risk of developing pulmonary disorders (Faria et al., 2006; Guillam et al., 2013; Viegas et al., 2013). Respondents reported a higher prevalence of cough (87.5%) and phlegm production (65%) compared to chest pain (30%),

Table 2. Predisposing factors of respiratory symptoms among the poultry farm workers.

Risk/Predisposing factors	Study population (N = 400)	
	Frequency (n)	Percentage (%)
Smoking habit of the worker		
Smokers	130	32.5
Non smokers	270	67.5
Number of hours spent at workplace		
1 hour	10	2.5
3 hours	140	35
6 hours	220	55
12 hours	30	7.5
Duration of work years		
<1 year	20	5
1-4 years	200	50
5-9 years	100	25
10-14 years	40	10
> 15 years	40	10
Pre-existing respiratory health condition (as diagnosed by a medical personnel)		
Bronchitis	10	2.5
Pneumonia	22	5.5
Pulmonary Tuberculosis	6	1.5
Bronchial Asthma	2	0.5

Table 3. Relationship between respiratory symptoms and smoking habits.

Respiratory symptoms	Smokers		Non smokers		Spearman correlation (r) p-value < 0.05
	Yes	No	Yes	No	
Cough	130	0	220	50	0.262
Phlegm production	130	0	130	140	0.509
Breathlessness	120	10	0	270	0.943
Wheeze	130	0	0	270	1.000
Chest tightness	120	10	0	270	0.943
Chest pain	130	0	140	130	0.481

chest tightness (30%) and wheeze (32.5%) as shown in Table 1. Similar results have been reported by Jaiyesimi and Agbaje (2015) in a study on poultry workers in Ibadan, Nigeria with cough at 49.3%,

phlegm at 56% and wheeze at 7.3% and Guillam et al., (2013) reported cough at 79% and shortness of breath at 21%. These results imply that upper respiratory tract involvement in symptom

Table 4. Relationship between respiratory symptoms and duration of work years.

Respiratory symptoms	Work duration (years)										Spearman correlation (r) p-value < 0.05
	Less than 1 year		1-4 years		5-9 years		10- 14 years		15 years and above		
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Cough	18	0	200	0	132	8	0	40	0	2	0.590
Phlegm production	18	0	200	0	42	98	0	40	0	2	0.804
breathlessness	18	0	102	98	0	140	0	40	0	2	0.612
wheeze	18	0	112	88	0	140	0	40	0	2	0.640
Chest tightness	18	0	102	98	0	140	0	40	0	2	0.612
Chest pain	18	0	200	0	52	88	0	40	0	2	0.774

presentation is more likely compared to lower respiratory tract involvement in symptom presentation as the latter is associated with chest pain, wheeze, chest tightness and breathlessness (Tobin et al., 2016). This finding as similarly reported by other investigators might be as a result of the fact that poultry dust irritates the cough receptors and causes mucositis in the upper respiratory tract leading to cough and phlegm production; mostly due to immune response against pathogenic biological agents (Viegas et al., 2013; Tobin et al., 2016). Wheeze was the third most common symptom observed in this study. The presentation of wheeze is generally understood in relation to asthma and allergic sensitization (Faria et al., 2006; Hamid et al., 2018) but recent studies have shown that wheeze is also associated with viral pneumonia (WHO, 2012) and there is an increased risk of pneumonia among individuals living near or working in poultry farms (Poulsen et al., 2018). In this study wheeze, shortness of breath, chest pain and chest tightness occurred at almost similar frequencies. These symptoms occurring together with cough has been associated with lower respiratory tract infections of pneumonia, bronchitis (Javis, 2016); bacterial meningitis, tuberculosis, bronchiolitis, scarlet fever (Kerkar, 2018) and asthma (Ngajilo, 2014). Headache (22.5%), sneezing (21.3%), fever (4%), nasal congestion (12.5%), eye irritation (8.8%) were also reported by the farmers and similar symptoms have been reported in previous studies (Viegas et al., 2013; Ngajilo, 2014; Jaiyesimi and Agbaje, 2015; Hamid et al., 2018). Hamid et al., (2018) reported eye irritation at 16.9% to 31% and it was attributed to poultry dust as most people may be sensitized to dust

such that even low exposure level may trigger eye or/and nasal irritation or worsen asthma (HSE, 2009). According to Ngajilo (2014), these symptoms are usually acute and non-specific and may disappear during periods away from work. The prevalence of respiratory symptoms tends to vary largely among different worker groups. Park et al., (2006) reported a prevalence of cough at 2.4%, phlegm at 8.1%; wheeze at 2.8% and breathlessness at 7% in a study of petrochemical workers in Korea. Among tannery workers in Pakistan, cough was presented at 25%, breathlessness at 41%, wheeze at 20%, chest tightness at 23% (Jamal et al., 2017). Studies on industrial workers in Iran showed a prevalence of cough at 20.9%, phlegm at 41.6%, chest tightness at 27.4% and nose irritation at 23.5% (Ghasemkhani et al., 2006). According to Park et al., (2006), these differences among various study population in the prevalence of respiratory symptoms can be attributed to differences in epidemiological characteristics and predisposing factors.

In this study, a higher percentage of the respondents were non-smokers. This observation is in line with observations by Hamid et al., (2018) in whose studies; 32% of the workers were smokers and 60% were non-smokers. According to Tobin et al., (2016), dust can act on the respiratory tract independent of smoking and Viegas et al., (2013) supports this; stating that prevalence rates of respiratory symptoms tend to be higher with exposure rates to dust regardless of smoking status. Studies by Alencar et al., (2004) however, reported that smokers have higher chances of respiratory risk incidence than non-smokers when working in poultry farmers and thus the current smoking habit of a

worker is a significant predictor of respiratory symptoms. Ngajilo (2014) reported that smoking has a huge influence on the incidence of cough and no direct effect on breathlessness. In this study however, smoking had a weak association with cough, moderate association with phlegm production, strong association with breathlessness and chest tightness; and perfect association with wheeze. Health and Safety Executive (2009) pointed out that the length of time a worker has been exposed is correlated with the risk of respiratory symptoms; and respiratory symptoms have been reported among poultry farmworkers with 5 or more years of occupational exposure; with the odds of having cough, wheeze and breathlessness increasing as the years increase. In this study, most of the workers spent a maximum of 6 hours at their workplace daily (55%). Respiratory symptoms were more pronounced among workers who have spent 1-4 years at their work place; and duration of work years had a moderate association with breathlessness, chest tightness, wheeze, chest pain, cough; while having a strong association with phlegm. Of all health conditions been diagnosed by medical personnel prior to this study, as reported by the poultry farm workers, pneumonia was the highest case (5.5%). Smit et al., (2017) and Poulsen et al., (2018) pointed out that ambient air pollution increases the risk of lower respiratory infections especially pneumonia as exposure to air pollutants such as particulate matter induces oxidative stress in pulmonary macrophages and epithelial cells by reducing the lungs defenses against bacterial pathogens and disrupting the composition of the oropharyngeal micro-biota thus increasing the susceptibility to respiratory infections; since a balanced micro-biota provides resistance to the acquisition and establishment of pathogens and prevents the overgrowth of pathobionts such as *Streptococcus pneumoniae*. Studies by Friedl et al., (2017) and the Netherlands National Institute of Public Health and the Environment (2018) affirms that living close to or working in poultry farms and/or goat farms has a significant positive association with pneumonia. According to Borghetti et al., (2002), it is possible for workers to be exposed to mites (storage mites: *Lepidoglyphos destructor*) and their allergens, aeroallergens, feeds and their contaminants; which in turn leads to allergic sensitization, wheezing, rhinitis, dermatitis and asthma among poultry farm workers. In this study, asthma was reported 0.5% and studies by Hamid et al., (2018) reported 1.4% asthma cases among poultry farmworkers in Pakistan; and Viegas

et al., (2013) reported a higher 6.4% incidence of asthma. Asthma tends not to increase in animal farms and such low prevalence may be due to the fact that farmers with asthma are likely to quit their job due to exacerbation of their symptoms; or according to Mirabelli et al., (2012) and Viegas et al., (2013), a respiratory specific healthy worker effect comes into play wherein individuals who are eligible to work in poultry industries but have allergies or respiratory health conditions do not seek employment in the industry or leave the job; leaving the healthier ones employed. In this study, the admission criterion was not obtained and data for workers that left the job due to health problems were also not obtained. These data may help give a splendid explanation for results being obtained.

CONCLUSION

The poultry industry in a developing country like Nigeria faces the challenge of providing work environments where hazards are properly contained. Poultry workers in Owerri senatorial zone are like their counterparts elsewhere, and; thus study confirms these poultry workers are at an increased risk of developing adverse respiratory outcomes as symptoms such as cough, phlegm, breathlessness, wheeze, chest pain, nasal congestion, sneezing, runny nose and headache were widely reported by the poultry farmworkers. There is a need for thorough pre-employment medical examination and an establishment of a robust medical surveillance system as it will help ensure proper placement of employees; and assist in early detection and management of respiratory and other medical conditions as employees will be given information about the health risks associated with exposure to poultry dust and relevant symptoms to look out for while reporting to the nominated responsible persons.

RECOMMENDATIONS

Provision of well-developed occupational health services in the country is highly recommended and health care providers should familiarize themselves with the agricultural activities that occur in their region to identify possible agents and be alert for relevant respiratory symptoms. Results obtained emphasizes the need for employers of poultry workers to invest in

the provision and enforcement of internationally recommended personal protective equipment such as respirators, appropriate and comfortable mouth and nose masks and protective goggles; and improved poultry dust control in the industry as this will help decrease the burden of respiratory diseases among poultry farmworkers.

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